



Energy

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UNPEPP

University National Park Energy Partnership Project



“to provide energy services to the parks and
real-world problem-solving opportunities
to university students”

Goals

- (1) conduct energy assessments of park facilities;
- (2) train NPS personnel on sustainable energy practices;
- (3) provide hands-on learning experiences for university students, and
- (4) design and implement energy management plans and renewable energy systems at National Parks

At INDU: 2008

- Energy Audits
- Geothermal Heat Pump System:
Douglas Center
- Grass Roof: Building 110-Old Fire Cache
- Educational Materials on proposed
improvements

Energy Audits

- 12 Buildings
- Energy Use:
 - HVAC
 - Appliances
 - Unnecessary usage
 - Behavior
- Recommendations
- ROI



Payback Periods for Standard Improvements

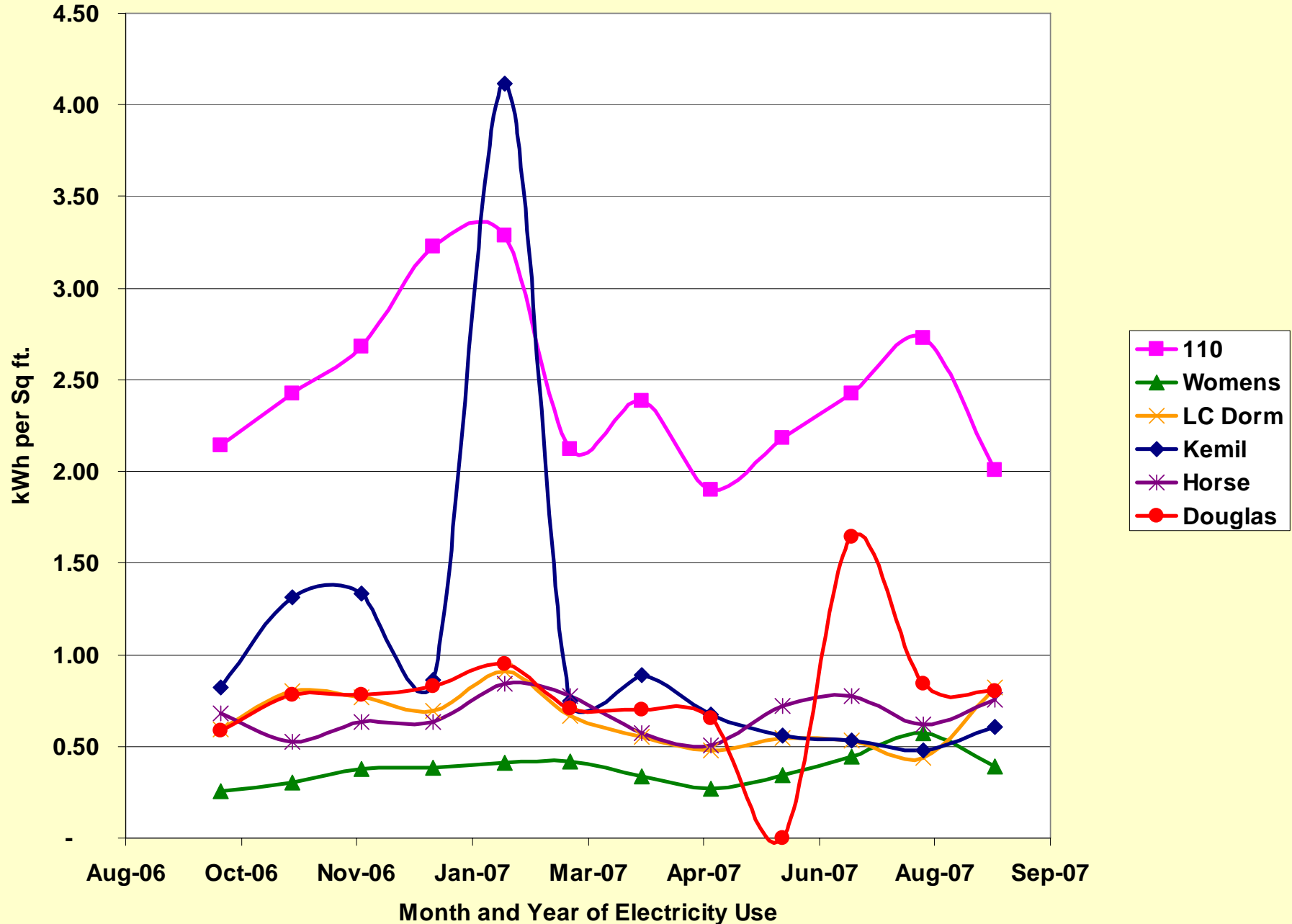
	Film Savings	Film Costs	Payback (yrs)	Inst Water Heater Savings	Water Heater Costs	Water Heater Payback (yrs)	Motion Sensor Payback Period
101	\$331.70	\$3,100	9.35	\$96.90	\$599.98	6.19	
102	\$747.08	\$4,960	6.64	\$233.33	\$599.98	2.57	
103	\$158.22	\$1,116	7.05	\$48.45	\$599.98	12.38	
104	\$781.36	\$4,712	6.03	\$96.90	\$599.98	6.19	
110	\$26.74	\$248	9.28	\$361.35	\$599.98	1.66	
112	\$296.62	\$2,232	7.52	\$69.87	\$599.98	8.59	
Douglas	\$943.58	\$13,764	14.59	\$106.08	\$1,199.96	11.31	
Annex	\$246.32	\$3,596	14.60				
LC				\$2,964.27	\$5,999.80	2.02	
Kemil							0.55
Horse							0.55
Women's	\$75.02	\$1,705	22.73	\$124.06	\$599.98	4.84	
Totals	\$3,563.66	\$33,728	9.46	\$4,004.17	\$10,789.82	2.69	
	<i>Total Savings</i>	<i>Costs</i>	<i>Total Payback (yrs)</i>	Total Savings	Costs	Total Payback (yrs)	
	\$7,984.76	\$46,992.80	5.89	\$6,538.29	\$25,527.88	3.90	

Most Cost-Efficient Improvements

- Night-time setbacks on thermostats
 - Additional \$2,300/yr could be saved



Electricity Use by Building



Green Roof: Building 110

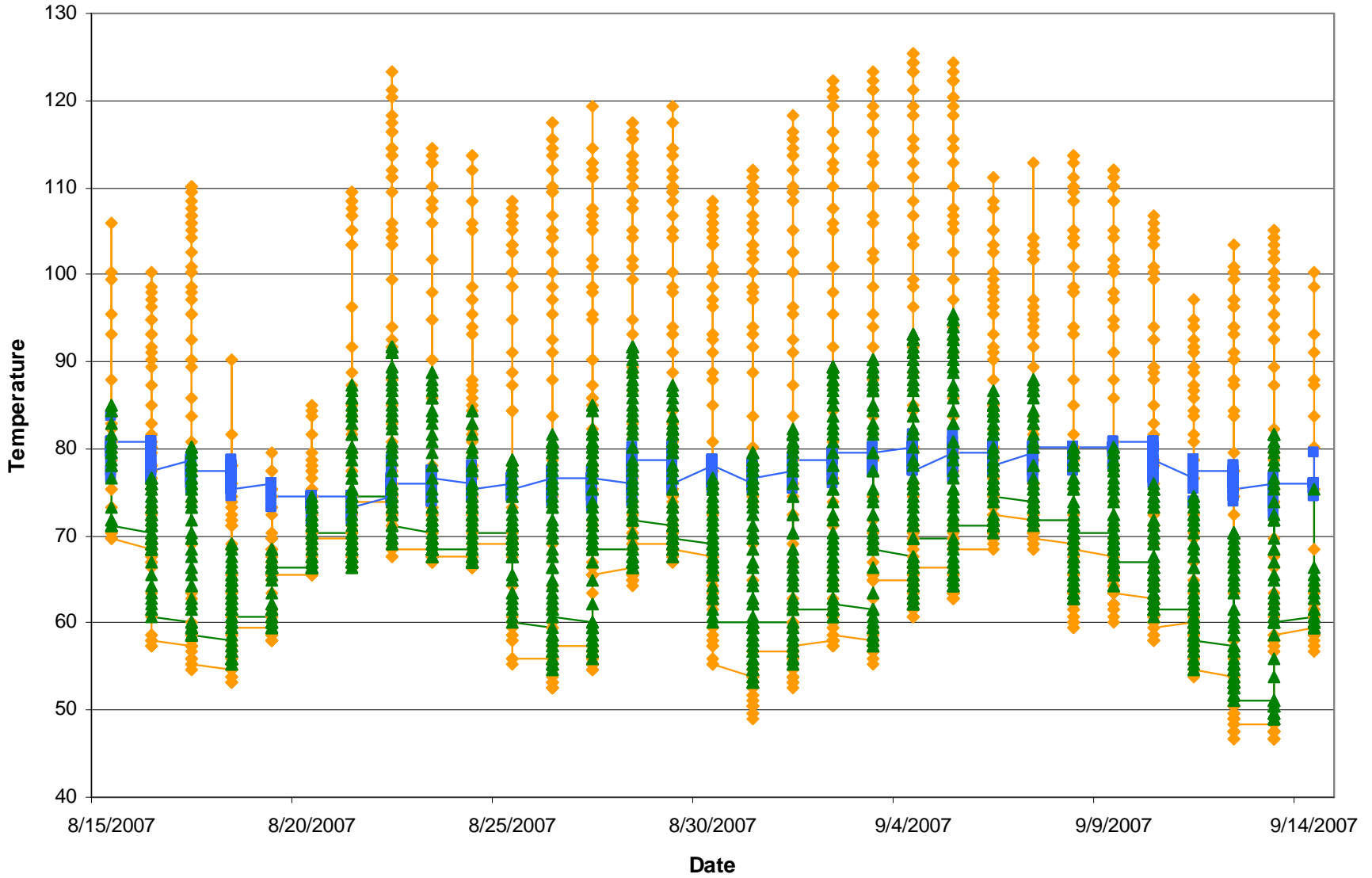
- Stability
- Central Location



Hundertwasser

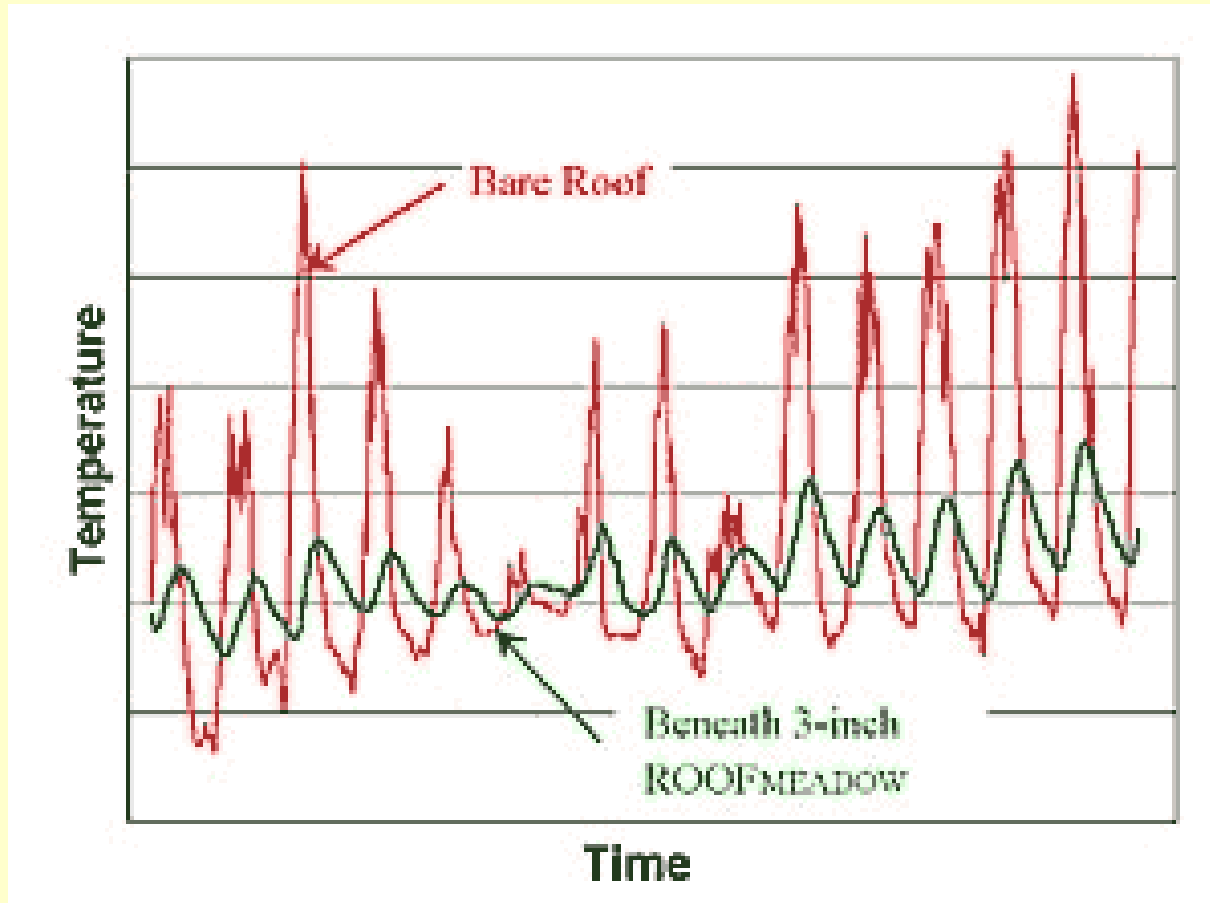
- High Energy Usage

Building 110 Roof Temperatures



—◆— Building 110 Roof —■— Building 110 Ceiling —▲— Weather Station

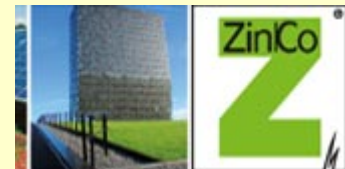
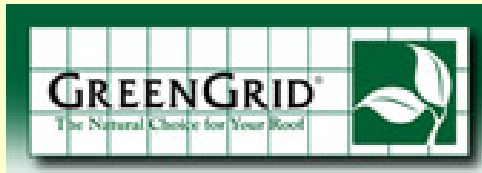
Mitigation of Roof Temperature Fluctuation



Data from Roofmeadow study at Fencing Academy of Philadelphia

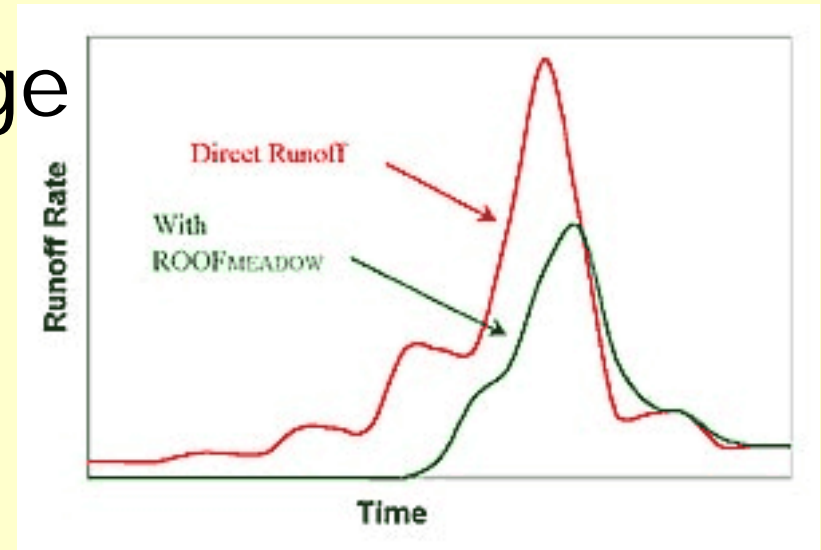
Extensive Green Roof

- 2-6 inch thick soil medium
- \$15-25 per square foot
- Modular vs. non-modular
- Low Maintenance



Benefits

- Heating/Cooling Savings
 - 10-25%
- Heat Island Effect
- Stormwater Drainage
- Waterproofing
- Life Expectancy
- Educational

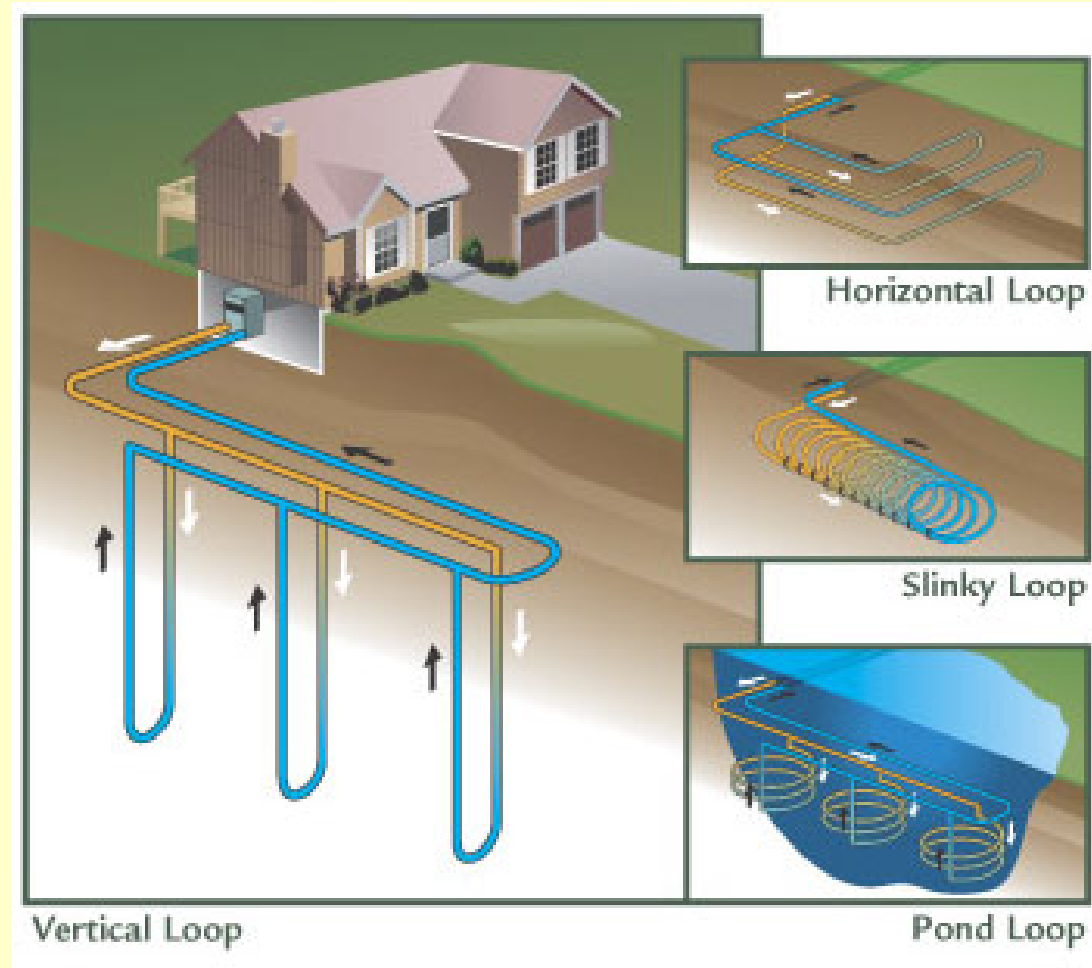


Chicago Green Roof Initiative:

<http://www.artic.edu/webspaces/greeninitiatives/greenroofs/main.htm>

Ground-Source Heat Pump (GSHP)

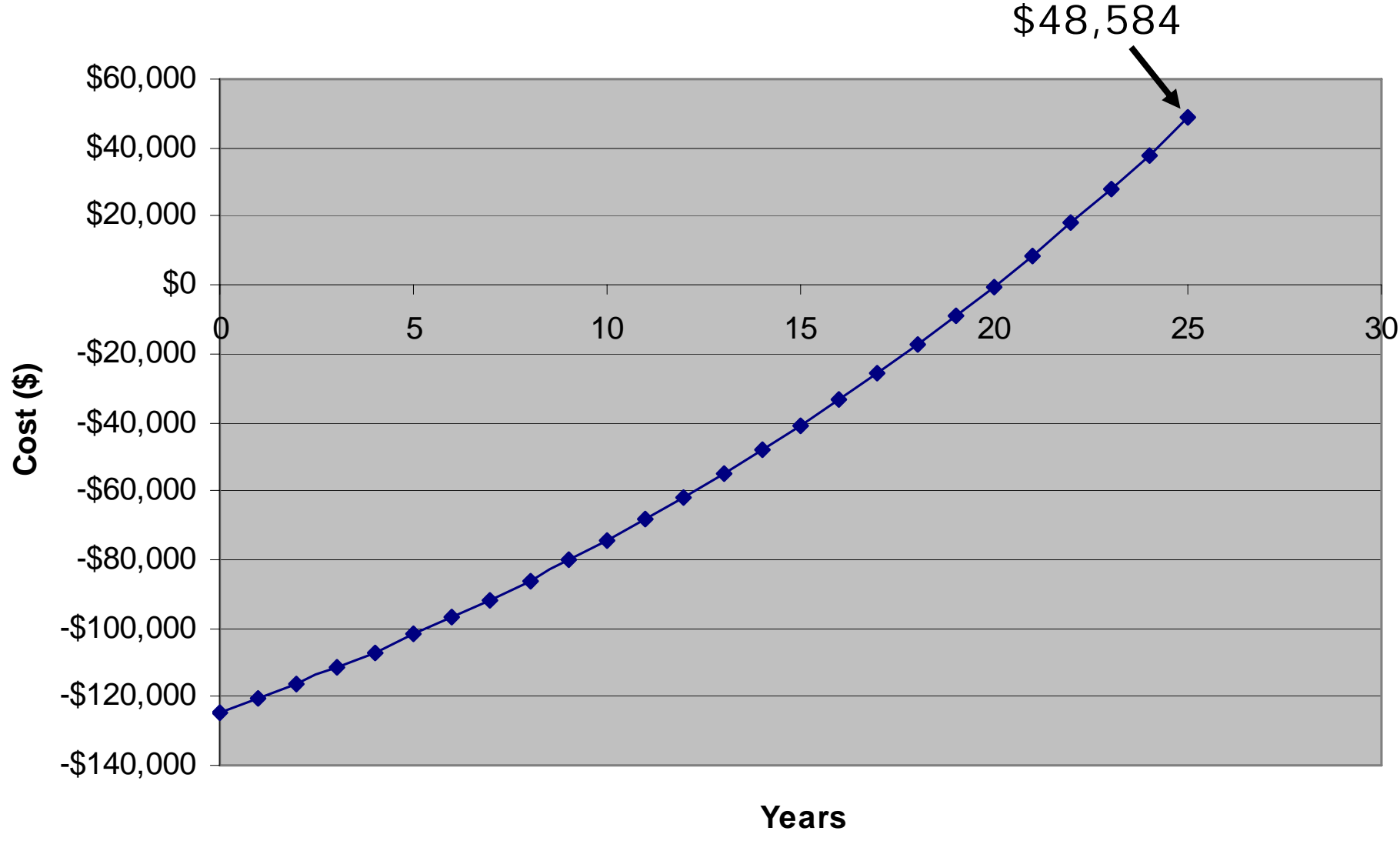
- Relies on constant underground temperature (50-60°F)
- Exchanges heat between ground and building
- Eliminates need for natural gas



Geothermal heating: Douglas Center

- 4 units – ClimateMaster GRV/GRH060AF
– \$4,000 each
- 13 wells at approximately 500 ft deep
– \$16/ft
- Total Cost - \$124,795
- 4.5% Inflation Rate
- 3.913% Fuel Escalation Rate
- \$10,848/yr currently - \$6,794/yr after =
\$4,054/yr
- 20.1 Year Payback
- 25 Year Lifespan

Ground-Source Heat Pump Payback Period



Questions?